Uva Wellassa University, Sri Lanka

Btech. Science and Technology
B.Sc. Mineral Resources and Technology
B.Sc. Computer Science and Technology
BIIT Industrial Information Technology

End Semester Examination- Semester 1
January -2009

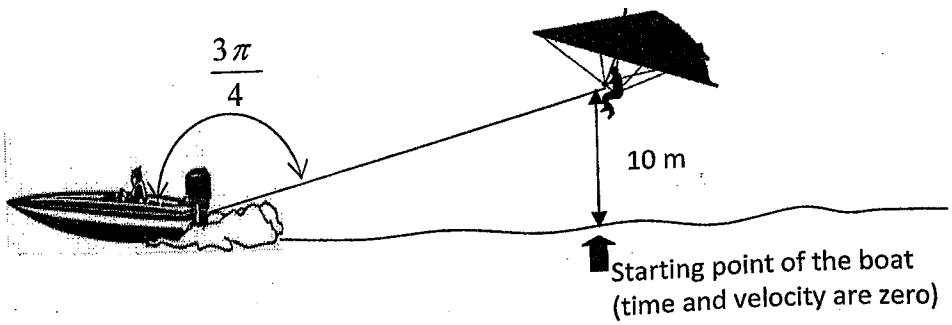
SCT 104-2 – Essential Mathematics

Answer four (4) questions only **Time: Two (02) hours**
Each question carries equal marks

1. A. A glider is driven by a running boat. When the time is zero, the velocity of the boat is also zero. After 55 seconds, the glider is 10 m above the water surface (see the figure). Find the velocity of the boat.

Hint, velocity = distance /time

(State your assumptions, if any)



B. Prove that

i. $2\sin\alpha\cos^3\alpha+2\sin^3\alpha\cos\alpha=\sin 2\alpha$

ii. $\cos^4\alpha-\sin^4\alpha=\cos 2\alpha$

2. A. How many lines can be drawn from 6 points, if none of 3 points is co-linear?

   B. A certain building has 12 entrances. In how many different ways can someone enter the building through one entrance and leave through a different one?

   C. At the beginning and the end of every meeting of a certain club, each member must give the ritual handshake to each member. If there are 20 members attended the meeting, how many different handshakes will takes place?

3. A. If $Z_A = 2+2i$ and $Z_B = 2+i$, calculate

   a. $Z_A Z_B$

   b. $\frac{Z_A}{Z_B}$

   B. In a parallel electronics circuit with two legs, total impedance (Z_T), is given as $Z_T = \frac{Z_1 Z_2}{Z_1 + Z_2}$. Find the total impedance (Z_T) in the circuit, if $Z_1 = 2+i$ and $Z_2 = 3-5i$.

4. A. Expand using binomial theorem

   a. $\left(a + \frac{\sqrt[3]{b}}{a}\right)^6$

   b. $\left(x^2 - \frac{1}{\sqrt[3]{x}}\right)^4$

   B. Find the ratio between 2nd term to 3rd term $\left(\frac{T_2}{T_3}\right)$ of $\left(p^2 - \left(\frac{1}{2} \times p \times \sqrt[3]{q}\right)\right)^5$

C. Prove the following (using binomial theorem)

$$\frac{(x+h)^{13}-x^{13}}{h}=(x+h)^{12}$$

5. Solve for x

a. $\log_{512} 64 = x$

b. $\log_{\frac{1}{3}} x = -4$

c. $\log(x^3-8)-\log(x-2)=0$